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EXPERIMENTAL PELLAGRA IN THE HUMAN SUBJECT BROUGHT ABOUT BY A RESTRICTED DIET.

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In this communication we present a brief outline, with the results, of an experiment planned to test the possibility of producing pellagra in the healthy human, white, adult male, by a restricted, one-sided, mainly carbohydrate (cereal) diet.

The experiment was carried out at the farm of the Mississippi State Penitentiary, about 8 miles east of Jackson, Miss. At about the center of this farm of some 3,200 acres, well isolated from the surrounding communities, is the "camp," consisting of a group of frame buildings, including the cottages of the officials, the "cage," "new hospital," barns, stables, etc. Dr. A. G. McLaurin, the prison physician, informs us that there is no history of the occurrence or presence of pellagra on this farm.

During the period of the experiment there have been quartered at this "camp" an average of between 70 and 80 convicts, all white males. Included in this number were 12 who, accepting the offer of a pardon made them by Gov. Brewer and with the assurance of proper care and treatment should such be needed, volunteered to submit themselves to the experiment. White adult males were selected because, judged by the incidence in the population at large, these would seem to be least susceptible to the disease.

Experiment.

The volunteer squad of 12 men was organized between February 1 and February 4, 1915. On July 1, 1915, one of the volunteers was released because of the development of a prostatitis. This left 11 men in the squad, 24 to 50 years of age, who have remained in the test, on the prescribed diet, to its termination, October 31, 1915. These men were quartered in the so-called "new hospital building," a small, screened, one-storied cottage, about 500 feet from the "cage" in which the other convicts were domiciled. This cottage had previously been used as the quarters for the "assistant sergeant" of the "camp." From the time of its organization this squad was strictly segregated and under guard day and night.

From February 4 to April 19, 1915, these men were kept under observation without any change being made in their diet. Having detected no evidence of pellagra during this preliminary observation period and having established the desired routine of work and discipline, the diet was changed at noon April 19, 1915. The character of the experimental diet is shown by the following menu:

BILL OF FARE, WEEK ENDED AUGUST 8, 1915.

August 2.

Breakfast: Biscuits, fried mush, grits and brown gravy, sirup, coffee with sugar.

Dinner: Corn bread, cabbage, sweet potatoes, grits, sirup.

Supper: Fried mush, biscuits, rice, gravy, cane sirup, coffee, sugar.

August 3.

Breakfast: Biscuits, mush, rice, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, grits, sirup.

Supper: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

August 4.

Breakfast: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, rice, sirup.

Supper: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

August 5.

Breakfast: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, grits, sirup.

Supper: Biscuits, mush, rice, gravy, sirup, coffee, sugar.

August 6.

Breakfast: Biscuits, mush, rice, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, grits, sirup.

Supper: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

August 7.

Breakfast: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, rice, sirup.

Supper: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

August 8.

Breakfast: Biscuits, mush, grits, gravy, sirup, coffee, sugar.

Dinner: Corn bread, collards, sweet potatoes, grits, sirup.

Supper: Biscuits, mush, rice, gravy, sirup, coffee, sugar.

The quantities of the different articles of food consumed during the above-named week were as follows:

Biscuits, 41.81 pounds; corn bread, 24.56 pounds; grits, 27.06 pounds; rice, 24.25 pounds; fried mush, 33.87 pounds; brown gravy, 37.81 pounds; sweet potatoes, 23.62 pounds; cabbage, 4.25 pounds; collards, 23.75 pounds; cane sirup, 5.94 pounds, making a total of 255.67 pounds of food consumed during the week, or 3.32 pounds per man per day, having a caloric value of 2,952 calories per man per day. The sugar was white granulated, the sirup a "homemade" cane sirup. No vegetable fats entered into the diet. The corn meal and grits were of the best quality obtainable in the local market and the same as used at one of the orphanages ("M. J."), Jackson, Miss., at which a feeding experiment to prevent pellagra was conducted and at which no pellagra occurred this year.¹

¹ Public Health Reports, Oct. 22, 1915.

The character of the labor performed by these men during this same week may be judged by the following: Whitewashing fences and buildings, $2\frac{1}{2}$ days; sawing lumber (ram sawmill), 2 days; rest, $2\frac{1}{2}$ days.

Controls.—The entire population of the "camp" was kept under observation. We have, however, given special attention to the group of convicts who were not "trusties" when the experiment was begun; 20 of these have remained under continuous medical surveillance, comparable to that of the volunteers, throughout the whole period of the experiment.

Work.—The volunteers kept about the same hours and did about the same kind and the same amount of work as the other convicts. Such differences as existed were in favor of the volunteers, especially during the latter portion of the experimental period.

Hygiene.—The general sanitary environment was the same for volunteers and controls, but the hygienic environment—personal cleanliness, cleanliness of quarters, freedom from insects, particularly bedbugs—was decidedly in favor of the volunteers.

Results.

Of the 11 volunteers, not less than 6 developed symptoms, including a "typical" dermatitis, justifying a diagnosis of pellagra. The nervous and gastro-intestinal symptoms were mild but distinct. The dermatitis was first noted between September 12 and September 24, 1915, or not later than five months after the beginning of the restricted diet. It is of great interest to note that in all our cases the skin lesions were first recognized on the scrotum. Later there appeared lesions on the backs of the hands in two cases and the back of the neck in one case. The scrotal lesions conformed to the type described and figured by Merk.¹ This experience would suggest that the scrotal lesion is a much more common early skin manifestation than has heretofore been believed. It would probably have escaped us but for the fact that it was our routine to examine these men, and the special control group, completely stripped.

No person in the "camp" not of the volunteer squad has presented evidence justifying even a suspicion of pellagra.

The diagnosis in the above cases was concurred in by Dr. E. H. Galloway, secretary Mississippi State Board of Health, and Dr. Nolan Stewart, formerly superintendent Mississippi State Hospital for Insane, at Jackson, Miss.

We are very greatly indebted to Dr. Marcus Haase, professor of dermatology, Medical College of the University of Tennessee, Memphis, Tenn., and to Dr. Martin F. Engman, professor of dermatology in the

¹ Merk (Ludwig), *Die Hauterscheinungen der Pellagra*. Innsbruck, 1909, p. 24, fig. 6.

Washington University Medical School, St. Louis, Mo., for assistance in excluding the other known dermatoses.

Conclusion.

The conclusion is drawn that pellagra has been caused in at least 6 of 11 volunteers as the result of the restricted diet on which they subsisted.

Acknowledgments.

The above experiment was made possible by the cooperation of Gov. Brewer, whose interest was enlisted by the intervention of Dr. Galloway. To these gentlemen acknowledgments are due and are here made for their invaluable assistance.

PLAGUE-PREVENTION WORK.

CALIFORNIA.

The following report of plague-prevention work in California for the week ended October 23, 1915, has been received from Senior Surg. Pierce, of the United States Public Health Service, in charge of the work:

SAN FRANCISCO, CAL.			
RAT PROOFING.		OPERATIONS ON THE WATER FRONT.	
New buildings:		Vessels inspected for rat guards.....	17
Inspections of work under construction.....	177	Reinspections made on vessels.....	31
Basements concreted (square feet, 47,130).....	80	New rat guards procured.....	18
Floors concreted (square feet, 99,432).....	34	Defective rat guards repaired.....	13
Yards, passageways, etc. (square feet, 35,956).....	95	Rats trapped on wharves and water front..	43
Total area concrete laid (square feet).....	182,518	Rats trapped on vessels.....	26
Class A, B, and C (fireproof) buildings:		Traps set on wharves and water front.....	170
Inspections made.....	165	Traps set on vessels.....	76
Roof and basement ventilators, etc., screened.....	3,608	Vessels trapped on.....	16
Wire screening used (square feet).....	17,766	Poisons placed on water front.....	3,600
Openings around pipes, etc., closed with cement.....	2,834	Poisons placed within Panama-Pacific International Exposition Grounds.....	7,200
Sidewalk lens lights replaced.....	4,980	Bait used on water front and vessels, bacon (pounds).....	6
Old buildings:		Amount of bread used in poisoning water front (loaves).....	12
Inspections made.....	465	Poison used on water front (pounds).....	6
Wooden floors removed.....	28	RATS COLLECTED AND EXAMINED FOR PLAGUE.	
Yards and passageways, planking removed.....	13	Collected.....	427
Cubic feet new foundation walls installed.....	6,815	Examined.....	237
Concrete floors installed (square feet, 47,406).....	45	Found infected.....	None.
Basements concreted (square feet, 23,815).....	25	RATS IDENTIFIED.	
Yards and passageways, etc., concreted (square feet, 18,063).....	71	Mus norvegicus.....	214
Total area concrete laid (square feet).....	89,284	Mus musculus.....	91
Floors rat proofed with wire cloth (square feet, 6,325).....	5	Mus alexandrinus.....	75
Buildings razed.....	14	Mus rattus.....	47
Garbage cans stamped approved.....	250	SQUIRRELS COLLECTED AND EXAMINED FOR PLAGUE.	
Nuisances abated.....	374	Contra Costa County.....	174
		Found infected.....	None.
		RANCHES INSPECTED AND HUNTED OVER.	
		Contra Costa County.....	26